REMARKS

Claim Status:

Claims 1-19 are currently pending. Claims 1, 9 and 15 are amended herein. The specification is amended herein to insert directly language heretofore incorporated by reference to U.S. Patent Application 09/947,846, now U.S. Patent No. 7,048,842 and to include the patent number where the application was cited. Basis for the amendments is in the specification at page 1, line 12, page 3, line 19 and page 20, lines 31-33 wherein the specification states that all documents cited, in relevant part, are incorporated by reference. Applicants reserve the right to pursue the original claims, or any previously presented claims, in this and/or other applications. Applicants respectfully request reconsideration of the above-referenced application in light of the amendments and following remarks.

Claim Amendment Support:

Independent claim 1 is amended herein. Support for the claim amendment is found in the specification -as-filed at least on page 6, lines 24-34; page 7, line 1-9; and in the specification as amended on page 17, in the Examples and Table. Independent claim 9 is also amended herein. Support for the claim amendment is found in the specification-as-filed at least on page 6, lines 24-34; page 7, line 1-9; and in the specification as amended on page 17, in the Examples and Table. Independent claim 15 is also amended herein. Support for the claim amendment is found in the specification-as-filed at least on page 6, lines 24-34; page 7, line 1-9; and in the specification as amended on page 17, in Example A and Table A (from Examples 1 and 6 and Table C of U.S. Patent No. 7,048,842, incorporated by reference).

Rejections under 35 U.S.C. § 102(b):

In the pending Office Action, claims 1 and 16 are rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 6,306,281 to Kelley ("Kelley"). Applicants traverse this rejection. Claim 1 is amended herein to recite, among other things, "an electric current supply configured to provide a current through the aqueous feed solution in the passage between the anode and the cathode wherein the system is structured to consume power at about

one Watt or less". Kelley does not disclose this feature. In each of the Examples shown in Kelley, the watts consumed would be significantly greater than one. For example, in Example 1, where the voltage was 6 volts and the current was 5 amperes, the total Watts consumed would be calculated based on the volts and amperes as about 30 Watts. (Power (W) = Voltage (V) x Current (I)). In Example 2, the power consumption would be about 28.8 Watts, in Example 3, the power consumption would be high based on the concentration of ClO_2 of 2500 ppm, in Example 4, the power consumption would be about 25.8 Watts, in Example 5, about 17.4 Watts, and in Example 6, about 18 Watts since the power supply is at 6V. Table A of the Subject Application, previously incorporated by reference, lists the power consumption of the claimed system at about one Watt or less. Therefore, independent claim 1 and dependent claim 16, which depends from claim 1, are not anticipated by Kelley. Accordingly, Applicants respectfully request withdrawal of the rejection under 35 U.S.C. §102(b).

Rejections under 35 U.S.C. § 103(a):

In the pending Office Action, claim 2 is rejected under 35 U.S.C. §103(a) over Kelley in view of U.S. Patent No. 4,414,070 to Spence ("Spence"). Claims 3-5 and 7-8 are rejected under 35 U.S.C. §103(a) over Kelley in view of U.S. Patent No. 5,106,465 to Kaczur et al. ("Kaczur"). Claim 6 is rejected under 35 U.S.C. §103(a) over Kelley in view of Kaczur, and further in view of German Patent No. DE-100,17,407 ("DE-407"). Claims 9-14 and 17-18 are rejected under 35 U.S.C. §103(a) over Kelley in view of Kaczur, and further in view of U.S. Patent No. 5,965,004 to Cowley et al. ("Cowley") and DE-407. Claims 15 and 19 are rejected under 35 U.S.C. §103(a) over Kelley in view of Kaczur, Cowley and DE-407, and further in view of U.S. Patent No. 6,328,875 to Zappi et al. ("Zappi"). Claims 9-14 and 17-18 are also rejected under 35 U.S.C. §103(a) over Kelley in view of Kaczur, and further in view of U.S. Patent No. 6,024,850 to Sampson et al. ("Sampson"), and further in view of Cowley and DE-407. Claims 15 and 19 are also rejected under 35 U.S.C. §103(a) over Kelley in view of Kaczur, Sampson, Cowley and DE-407, and further in view of Zappi. Applicants respectfully traverse all of the foregoing rejections.

The test for patentability under 35 U.S.C. § 103(a) requires that (1) the scope and content of the prior art be determined; (2) differences between the prior art and the claims at issue be ascertained; and (3) the level of ordinary skill in the pertinent art resolved. Against this background, the obviousness or nonobviousness of the subject matter is determined. *See* MPEP §2143 (Eighth edition, revision 6, September 2007). In an obviousness analysis, the controlling question is whether the differences between the prior art and the claimed invention are such that, despite the differences, the invention would have been obvious to one of ordinary skill in the art. *See* MPEP §2143 (The proper analysis is whether the claimed invention would have been obvious to one of ordinary skill in the art after consideration of all the facts, particularly the differences between the claims and the prior art).

Based on the Office's attempt to arrive at the claimed invention by combining portions of the disclosures in Kelley, Kaczur, Sampson, Spence, DE-407, Cowley, and Zappi, Applicants interpret the Office's rationale for rejection to be based on an asserted teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to combine these reference teachings to arrive at the claimed invention. *See* MPEP §2143 (Eighth edition, revision 6, September 2007). However, Applicants respectfully submit that the references cited by the Office, alone or in combination, fail to teach or suggest the claimed invention as a whole. Moreover, the general knowledge and understanding in the art fails to remedy the evident deficiencies in the cited references. Furthermore, Applicants submit that the primary reference cited by the Office – Kelley – teaches away from the combinations and modifications asserted by the Office.

Claims 1, 9 and 15 have been amended herein to recite, among other things, "an electric current supply configured to provide a current through the aqueous feed solution in the passage between the anode and the cathode wherein wherein the system is structured to consume power at about one Watt or less." Applicants submit that Kelley and the other cited references fail to teach or suggest this claim feature. As stated above, all of the Examples in Kelley disclose power consumption far greater than one Watt. The other references similarly do not disclose the

relatively low power consumption made possible by the claimed generating system. The conditions present, particularly the concentration of salts present between the anode and the cathode in the cited references indicate a high wattage. A higher concentration of salts is indicative of a high consumption of power and thus a relatively high wattage requirement.

Claims 1 and 9 include the claim feature reciting "a source of an aqueous halogen dioxide feed solution, the source comprising means for delivering halogen dioxide salt directly to an aqueous feed solution inlet stream to locally form the aqueous halogen dioxide feed solution". Claim 15 includes the claim feature reciting "a reservoir connected to said at least one electrolytic cell by a passage, said reservoir configured to automatically deliver halogen dioxide salt directly to the aqueous feed solution to locally form a halogen dioxide solution upstream from the inlet to the at least one cell chamber". Applicants submit that Kelley and the other cited references fail to teach or suggest this claim feature.

The Office asserts that Kelley inherently teaches means for locally delivering halogen dioxide salt to an aqueous feed inlet stream, relying on the following portion of the reference disclosure:

> A solution of 1 gram per liter of sodium chlorite, 5 grams per liter of sodium chloride, and 2 grams per liter of potassium hydrogen phthalate (KHP) was prepared. This solution was passed through the electrolysis cell at a rate of 125 cc/min. at 6 volts, giving a current of 2.9 amps. (Kelley, column 6, lines 60-64)

When this portion of Kelley is read in the context of the entire document,[1] it would be readily apparent to one of ordinary skill in the art that the solutions described therein are first pre-prepared on the bench outside of the electrolytic equipment, then the pre-mixed solutions are introduced to the equipment and passed through the electrolysis cell. The phrase "bench-top preparation" used in regard to the solutions described in Kelley does not refer to the size or scale of the equipment as the Office contends, but rather refers to the preparation of the solutions using

[1] A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. MPEP §2141.02(VI); *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984).

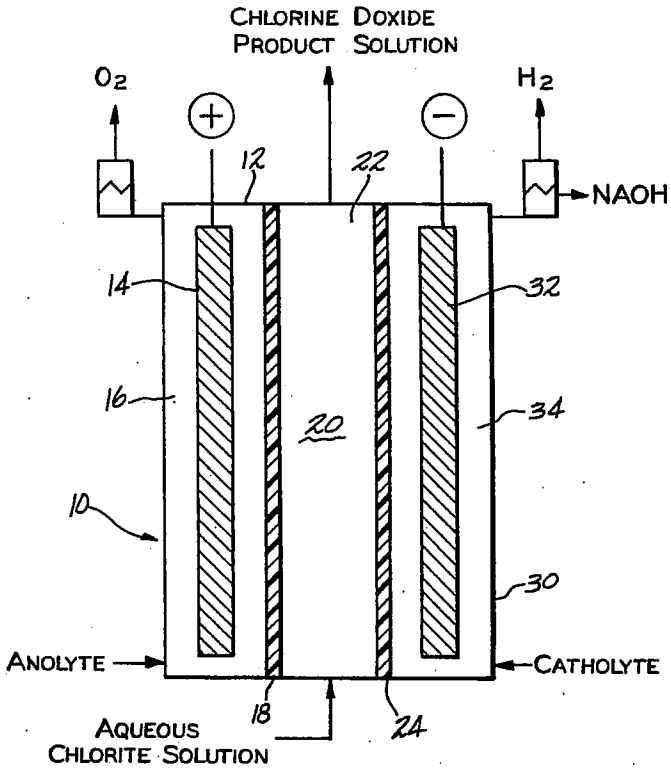
bench-top laboratory techniques.

Kelley describes first preparing a sodium chlorite solution and then passing the pre-prepared solution through an electrolysis cell. The solution in Kelley is not prepared locally according to any reasonable interpretation of the disclosure. Indeed, the *de minimis* disclosure in Kelley would neither teach nor suggest to one of ordinary skill in the art the claim feature reciting "a source of an aqueous halogen dioxide feed solution, the source comprising means for delivering halogen dioxide salt directly to an aqueous feed solution inlet stream to locally form a halogen dioxide salt solution". The other cited references similarly fail to disclose or otherwise suggest means for locally delivering a halogen dioxide salt to an aqueous feed solution inlet stream, and therefore, fail to rectify the deficiencies of Kelley.

Claim 9 includes the claim feature reciting "wherein said anode comprises a plurality of porous flow passages through which at least a portion of the aqueous halogen dioxide feed solution flows". Claim 15 includes an analogous feature. The Office asserts that this feature is taught by Kaczur. However, Applicants respectfully submit that Kaczur and the other cited references fail to teach or suggest this claim feature. Further, as states above, claim 9 has been amended to recite "an electric current supply configured to provide an electric current that flows between the anode and the cathode ... wherein the system is structured to consume power at about one Watt or less," a feature not disclosed or suggested in the cited references.

Kaczur discloses the use of "porous or high surface area anodes" (Kaczur, column 4, lines 44-45). However, this teaching cannot be isolated from the entirety of the teachings set forth in the reference as a whole.[2] When this portion of Kaczur is read in the context of the entire document, it would be readily apparent to one of ordinary skill in the art that even if the anode in Kaczur is porous, under no circumstances does the anode include flow passages through which at least a portion of an aqueous feed solution flows. This is because Kaczur expressly discloses isolating the anode, cathode, and feed solution into compartments separated by ion

exchange membranes (*see* Kaczur, Figure 1 and the associated text at column 3, lines 38-47).



As explicitly stated in Kaczur, "... the concentration of the anolyte is preferably selected to match the osmotic concentration characteristics of the chlorite solution fed to the ion exchange compartment [#20] to minimize water exchange between the anode compartment [#12] and the ion exchange compartment ... [which] minimizes the potentiality of chlorine dioxide entering the anode compartment." (Kaczur, column 4, lines 23-29). Indeed, Kaczur expressly teaches physically separating the flow of the feed solution from the anode (*i.e.* the feed solution containing the chlorite is isolated in the ion exchange compartment 20 which is separated from the anode in anode compartment 12 by cation exchange membrane 18). Therefore, Kaczur expressly teaches away from an anode comprising a plurality of porous flow passages through which at least a portion of the aqueous feed solution flows. Thus, contrary to the Office's assertion, Kaczur does not teach and can not reasonably suggest this claim feature, among others.

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[2] *See* footnote 1, *supra.*

Claims 9 and 15 provide that the anode and the cathode are separated by a non-conducting porous flow barrier structured and arranged to restrict flow of the aqueous feed solution through the cell chamber and thereby increase a proportion of aqueous halogen dioxide feed solution that flows through the anode. The Office asserts that this feature is taught by Kaczur and in the alternative by Sampson. However, Applicants respectfully submit that Kaczur, Sampson, and the additional cited references all fail to teach or suggest this claim feature

Kaczur discloses that "[a] thin protective spacer such as a chemically resistant plastic mesh can be placed between the membrane and the anode surface to provide for use of expanded metal anodes when using a liquid anolyte in the anode compartment. A spacer can also be used between the cathode and cation exchange [membrane] separating the ion exchange compartment from the cathode compartment [*sic*]." In addition, "separators and spacers may be used between the cation exchange membranes and the electrodes to provide a gas release zone." (Kaczur, column 8, lines 6-13 and 28-30). Example 9 in Kaczur discloses three layers of polypropylene spacer material with 1/8" square holes used to distribute the feed in the ion exchange compartment and physically support the ion exchange membranes (Kaczur, column 10, lines 56-59).

The use of a "thin protective spacer" such as a mesh in order to allow use of expanded metal anodes or to provide a gas release zone does not teach or suggest placing a porous flow barrier between the anode and cathode in order to restrict flow of an aqueous feed solution through a cell chamber and thereby increase a proportion of aqueous halogen dioxide feed solution that flows through the anode as presently claimed. One of ordinary skill would readily recognize that the spacers and separators mentioned in Kaczur function simply to ensure that the anode and/or cathode does not come into direct physical contact with the respective cation exchange membranes; especially with expanded electrodes, which may short circuit the anode and/or cathode compartment. The spacers and separators may also disengage oxygen gas from the anode compartment and hydrogen gas from the cathode compartment as these gases form in solution due to the segregated redox reactions occurring in each respective compartment

(*see,* for example, Kaczur at column 4, lines 9-15 and at column 10, lines 49-51). However, these teachings do not suggest the use of a porous flow barrier to restrict the flow of an aqueous halogen dioxide feed solution through a cell chamber and thereby increase a proportion of aqueous halogen dioxide feed solution that flows through the anode as presently claimed.

The Office also notes that Kaczur discloses three layers of polypropylene spacer material with 1/8" square holes used to distribute the feed in the ion exchange compartment and physically support the ion exchange membranes. Similarly, these teachings also fail to teach or suggest the porous flow barrier as presently claimed. Specifically, Kaczur provides:

> The central ion exchange compartment consisted of a 1/8" (0.318 cm.) thick compartment with inlet and outlet ports with a series of drilled holes to evenly distribute the aqueous chlorite feed flow in the compartment. Three layers of a polypropylene spacer material with 1/8" square holes (1/8" thickness total) was used to distribute the aqueous chlorite feed in the compartment and to physically support the cation exchange membranes. (Kaczur, column 10, lines 52-59).

The spacer material is described as distributing chlorite feed flow to the central ion exchange compartment. Thus, the spacer material in Kaczur assists feed flow through the ion exchange compartment. In contrast, the porous flow barrier as presently claimed restricts the flow of an aqueous feed solution through a cell chamber. One of ordinary skill in the art would not reasonably interpret a structure intended to facilitate flow distribution through an ion exchange compartment as teaching or suggesting a flow barrier to increase a proportion of aqueous halogen dioxide feed solution that flows through an anode as presently claimed. Thus, contrary to the Office's assertion, Kaczur does not teach and can not reasonably suggest this claim feature, among others.

Moreover, Applicants note that the disclosure in Kaczur related to spacers or separators relates to their function with respect to the cation exchange membranes. However, independent claims 1 and 9 of the Subject Application recite "non-membrane electrolysis cell". Accordingly, Kaczur relates to membrane-type electrolysis cells and claims 1 and 9 relate to non-

membrane type electrolysis cells. One of ordinary skill in the art would readily recognize that these two types of electrolysis cells are substantially different in terms of both physical construction and manner of operation. Nonetheless, the Office fails to explain how one of ordinary skill in the art would take account of these substantial differences when combining portions of the disclosure in Kaczur with portions of the disclosure in Kelley and the other cited references.

The Office asserts that Sampson also teaches or suggests the porous flow barrier as presently claimed when Sampson is considered with Kelley in view of Kaczur. Sampson discloses "modified ion exchange material for the electrolytic oxidation or reduction of inorganic and organic species and for electrolytically splitting water and generating free radical hydroxyl, free radical hydrogen, regenerant hydroxyl ion, and/or regenerant hydrogen ion in a packed bed electrolytic reactor containing the modified ion exchange material." (Sampson, column 1, lines 15-21). Additionally, Sampson refers to a packed bed of particulate ion exchange material (#16 in Figure 1).

One of ordinary skill in the art would readily understand "particulate ion exchange materials" as referring to insoluble matrices having ions attached on the surface of the material. The attachment sites bind ions from solution with the simultaneous release of previously bound ions; thus the term "ion exchange". Thus, given the transport of charged species that occurs within particulate ion exchange materials, one of ordinary skill in the art would readily recognize that such materials are conductive. However, claims 9 and 15 of the Subject Application include the claim feature reciting a "non-conducting porous flow barrier". One of ordinary skill in the art would not use an ion exchange material as a non-conducting porous flow barrier because it would inherently be conducting and thus defeat the express purpose for which it is used. Accordingly, contrary to the Office's assertion, Kaczur does not teach and can not reasonably suggest this claim feature, among others.

As discussed above, the combination of Kelley in view of Kaczur, Sampson and

the other cited references fails to teach or suggest the invention recited in the present claims. In addition, Applicants submit that Kelley teaches away from the reference combinations asserted by the Office to arrive at the claims. Specifically, Kelley states in connection with the electrolytic cell described therein that "[n]o membrane, asbestos barrier, or resin bed is required in this simple cell design." (Kelley, column 3, lines 20-21). In this regard, the disclosure in Kelley emphasizes the simplicity of the design described therein. Indeed, Kelley teaches that one of ordinary skill in the art would have no reason to modify the design in Kelley to include structures such as membranes or resin beds. Nonetheless, contrary to the express teaching in Kelley, the Office attempts to arrive at the claims by combining Kelley with portions of the disclosure in Kaczur directly related to ion exchange membranes as well as portions of the disclosure in Sampson directly related to packed ion exchange resin beds. The Office fails to explain why one of ordinary skill in the art, working with Kelley, Kaczur, Sampson, and the other cited references, would combine the disclosures of these references given the explicit teachings leading away from such combination.

The reference combinations asserted by the Office to arrive at the claims also disregards well-established law concerning the *prima facie* test for obviousness. If the proposed combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *See* MPEP §2143.01(VI). In other words, the proposed modification cannot "require a substantial reconstruction and redesign of the elements shown in [the prior art references] as well as a change in the basic principle under which the [prior art] construction was designed to operate." *See In re Ratti*, 270 F.2d 810, 813, 123 USPQ 349, 352 (CCPA 1959).

Applicants respectfully submit that one of ordinary skill in the art would have no reason to combine and modify the teachings of Kelley in view of Kaczur and/or Sampson because to do so would require substantial reconstruction and redesign of the arrangement, structure, operation and function of the components disclosed in the cited references. Indeed, as discussed above, Kelley emphasizes the simplicity of the design disclosed therein. Combining

the teachings of Kelley with those of the other cited references to arrive at the present claims would necessarily require a significantly more complex design than that emphasized in Kelley. This would involve more than the mere application of ordinary skill and would involve inventive steps. Thus, the cited references are not sufficient to render the present claims *prima facie* obvious.

As described above, none of the features of the present claims discussed above are taught or suggested in the cited references or in the knowledge and understanding generally available in the art. One of ordinary skill would have no reason to combine and modify the teachings of Kelley, Kaczur, Sampson, and the other cited references in order to arrive at the present claims unless they were using the Subject Application as a guide. Notwithstanding, even when using the Subject Application as a guide, Kelley teaches away from the asserted reference combinations. The combination of Kelley in view of Kaczur, Sampson, and the other cited references nonetheless fails to teach or suggest the claimed invention. In the Subject Application, the differences between the present claims and the prior art teachings are substantial, and the understanding of one of ordinary skill does not remedy the considerable differences. Thus, the present claims are not obvious and represent an inventive step over the prior art.

Independent claims 1, 9 and 15 are non-obvious. If an independent claim is non-obvious under 35 U.S.C. §103(a), then any claim depending therefrom is non-obvious. *See* MPEP 2143.03. Therefore, claims 1-19 are all non-obvious.

Based on the foregoing, Applicants respectfully request withdrawal of the rejection of claims 1-19 under 35 U.S.C. § 103(a), and allowance of claims 1-19 as set forth herein at an early date.

CONCLUSION

Applicants request that the present rejections be withdrawn. Applicants submit that claims 1-19 of the present invention recite systems and devices for the electrolytic generation of halogen dioxide that are both novel and non-obvious relative to the references cited in the Subject Application. In view of the foregoing, Applicants respectfully submit that the present application is in condition for allowance. Accordingly, allowance of the claims at an early date is respectfully requested.

If the undersigned can be of assistance to the Office in addressing issues to advance the application to allowance, please contact the undersigned at the number set forth below.

July 8, 2008
Date

Respectfully submitted,

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